

## Distribution, habitat and behavioural patterns of *Nickerlea sloanei* (Lea) (Coleoptera : Cicindelinae) in Southwestern Australia

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### Abstract

Until now only seven specimens of *Nickerlea sloanei* (Lea) have been collected and the species has been considered rare. The acquisition of a large series of fresh material allows data to be presented on the spatial and temporal distribution of the species. A quantitative description of the habitat and notes on the activity and behaviour of individuals in the field are given. The species inhabits *Acacia* and *Allocasuarina* dominated shrublands and species-rich heath shrublands between the 250 and 350 mm isohyets of the inland south-west of Western Australia. Adults are active for only a very short period between late February and late March, in association with significant rainfall events. Nothing is known of the immature stages of the life cycle.

### Introduction

The genus *Nickerlea* Horn contains two species; *distypsideroides* Horn from northern Australia, and *sloanei* (Lea) from southwestern Australia (Sumlin 1985). Only the holotype of the former species is known and until now, only seven specimens of the latter have been collected.\*

However the acquisition of freshly collected *N. sloanei* from pitfall traps allows a reappraisal of the species spatial and temporal distribution, as well as a quantitative analysis of its habitat. Observations of individuals in the field also provide some data on the species' activity and behavioural patterns.

### Methods

Most specimens were collected in pitfall traps ("Solo" plastic cups, 85mm diameter x 110mm deep), each containing a small amount of Galt's solution (70% sodium chloride, 15% potassium nitrate, 15% chloral hydrate and a few drops of glycerine). Traps were arranged in 15 x 15m grids, each with 16 traps spaced 5m apart, and were operated for 10 days every second month from November

1987. Prior to this date some preliminary trapping using smaller pits (plastic specimen tubes, 40mm diameter x 105mm deep) was undertaken, commencing mid 1986.

### Distribution

#### Spatial

Western Australia: Mullewa (type); Cue ?(Horn 1926); 15 km NW Badja, 28°31'S, 116°40'E, 17-18 iii 1982, T F Houston & B Hanish (3M, 1F); Durokoppin Nature Reserve 31°18'S, 117°50'E, 35 km NNE Kellerberrin, 1-10 iii 1988 G Friend & D Mitchell (16M, 12F), 21-25 iii 1988 G T Smith & G P Hall (1M), 26 ii 1989 to 8 iii 1989 G Friend & D Mitchell (22M, 61F), 16-26 iii 1989 G Friend & D Mitchell (8M, 7F); 20 km NW Kellerberrin, 16 iii 1988, G T Smith and C Dickman (1F); East Yorkrakine Nature Reserve 31°24'S, 117°39'E, 30 km NE Tammin, 16-26 iii 1989 G Friend and D Mitchell (2M, 3F); Heitman's Scrub 31°31'S, 117°34'E 20 km NE Tammin, 16-26 iii 1989 G Friend and D Mitchell (1M). These sites are shown on Fig. 1.

The specimens collected near Kellerberrin and Tammin in 1988 and 1989 represent a southerly extension to the known distribution of *N. sloanei* by over 300 km. Representative specimens have been deposited in the Western Australian Museum, Perth, and the Australian National Insect Collection, Canberra.

\* A series of specimens of a new *Nickerlea* species was collected in mallee-heath shrubland in the Stirling Range National Park (34°28'S, 118°15'E, 320 km south of Kellerberrin) in February 1990.

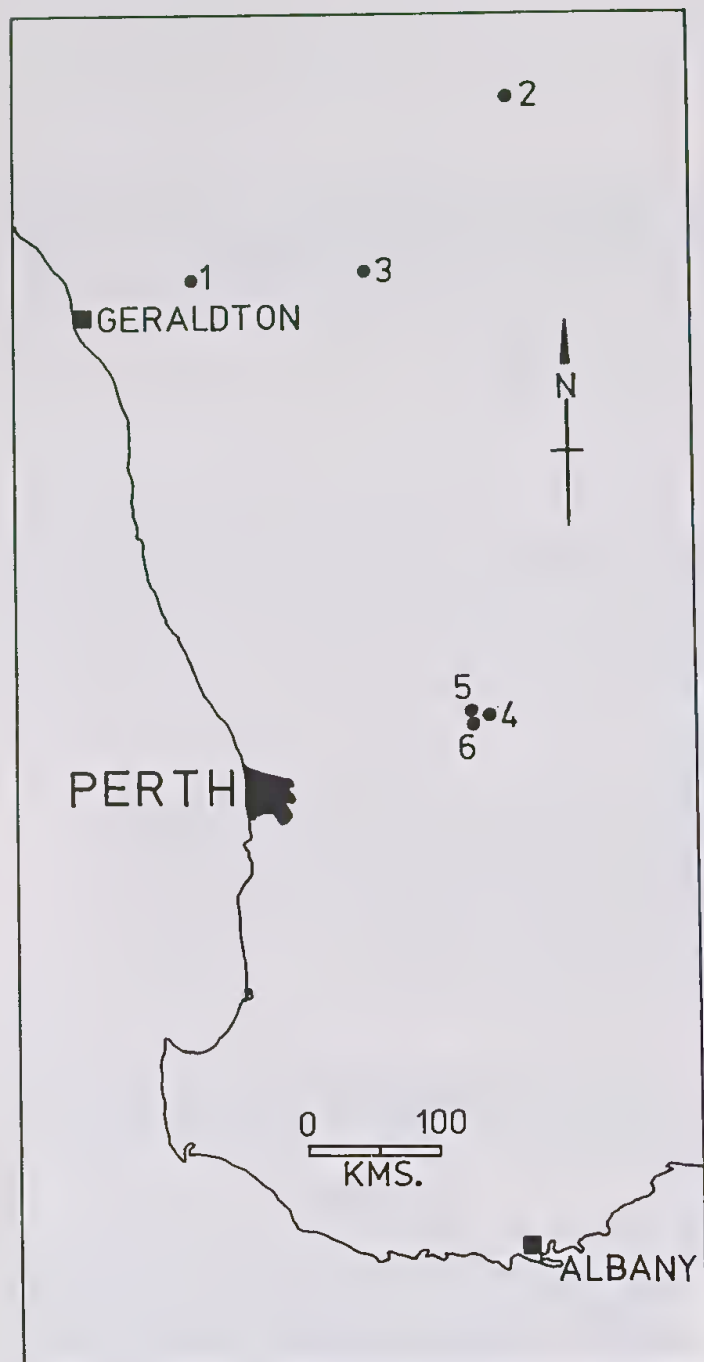


Figure 1 Collection sites (•) of *Nickerlen sloanei* in south-western Australia. 1 Mullewa, 2 Cue, 3 Badja, 4 Durokoppin Nature Reserve, 5 East Yorkrakine Nature Reserve, 6 Heitman's Scrub.

#### Temporal

Of the 140 specimens of *N. sloanei* recorded here, the time of collection is known for 138. It is noteworthy that all of these specimens have been collected between late February and late March. These data further define the temporal activity of Sumlin (1985) from "late summer/early fall" to a 4 week period between late February and late March. Furthermore, the limited data available suggest that activity periods may be associated with, or immediately precede the first significant rains of early

autumn. The specimens collected by Houston & Hanish in 1982 followed a heavy fall of rain in that area (Sumlin 1985), while in 1988 very heavy drought-breaking rains fell near Kellerberrin during the week 21-25 March. No such rainfall events occurred in the 1987 season (which was characterized by severe drought) and, although regular trapping had commenced in mid 1986, no *N. sloanei* were collected in 1987. The 1989 data further suggest that adults may emerge immediately before or after significant late summer rain which is not the beginning of general autumn rain.

#### Habitat

Until now the habitat of *N. sloanei* has been the subject of speculation (Sloane 1906, Sumlin 1985). The Kellerberrin and Tammin series allows a data-based description of the habitat to be reported. By the classification of Walker & Hopkins (1984) vegetation at the Durokoppin collection sites comprises a mid-height sparse heath shrubland with isolated emergents to 4-5m high. About 90% of the foliage is below 1m with a mean projected foliage cover (<2m) of 45%. Canopy cover (>2m) varies between 0 to 15%. The ground surface is about 85% bare, with leaf litter, woody litter ("trash" >5mm diameter) and surface vegetation each accounting for 5%.

Soils on the pitfall trap grids at Durokoppin Nature Reserve comprise yellow-brown sands supporting a relatively rich flora. The most common plant species include the sedge *Ecdeiocolea monostachya*, and the shrubs *Astroloma serratifolium*, *Baeckea floribunda*, *Leucopogon hamulus*, *Melaleuca conothamnoides* and an unnamed *Melaleuca* sp., *Verticordia chrysantha* and *V. picta*. Emergent taller shrubs comprise *Allocasuarina acutivalvis* and *Grevillea* spp. (*G. eriostachya*, *G. integrifolia* and *G. pritzelii*). In areas adjacent to the trap grids where the soil is more lateritic *Dryandra cirsioides* and *Mirbelia spinosa* occur, while *Eremaea pauciflora* and *Gompholobium* sp. are common in areas of white sand. Isolated individuals of *Xylomelum angustifolium* (woody pear) also occur throughout the habitat. The date of the last burn on Durokoppin is uncertain, but was probably in the 1920s.

The specimens from East Yorkrakine Nature Reserve were collected from grids in the far south-western corner of the reserve. The vegetation at this locality is described by Muir (1980). *Allocasuarina acutivalvis* and *Acacia stereophylla* are codominant and form a very tall (4-5m) mid-dense shrub stratum with c 65% canopy cover, and there is a sparse understorey of the sedge *Ecdeiocolea monostachya*. Soils are similar to those at the Durokoppin site. This reserve was last burnt by a high-intensity fire in summer 1927 (F L Diver, pers comm). The vegetation at the Heitman's Scrub site is very similar to that sampled at East Yorkrakine Reserve; this remnant is on private property and was last burnt before the turn of the century (Gardner 1957, B Y Main pers conum).

#### Activity and behaviour

Numerous adult *N. sloanei* were observed in the field on 26 ii 1989 during a pitfall trapping session between 26 ii 1989 and 8 iii 1989 at Durokoppin Nature Reserve. This followed significant summer rain (30.5mm) on 25 ii 1989.

Six live specimens were brought back to the laboratory in an attempt to establish a breeding colony, but this was unsuccessful.

In the field, animals were observed to run very rapidly then fly off, first vertically then horizontally, at high speed when approached. Consequently they are a very difficult species to observe and/or capture. Two of those captured alive were copulating. Specimens were observed between 1130 and 1500 h; weather conditions were fine and sunny, temperatures were between 26.0 to 32.0 C with about 50% relative humidity, and there was a strong easterly wind of about 25 km/h.

### Discussion

The results reported here indicate that *N. sloanei* is probably restricted to widely separated areas between the 250 and 350 mm rainfall isohyets of the inland south-west of Western Australia. Within this region the species occupies habitat varying from *Acacia* shrubland (Sumlin 1985) to medium to tall species - rich heath shrublands on yellow-brown sands. A large proportion of this vegetation has been cleared in the past 60-80 years for agricultural and pastoral purposes. This has resulted in the formation of small, isolated patches of native vegetation with substantially altered grazing and fire regimes, which in turn may have caused significant changes in the quality of these patches as habitat for *N. sloanei*. We therefore suspect that the viability of some *N. sloanei* populations in the region is tenuous.

In addition to the fragmented condition of suitable habitat, the very narrow and deterministic nature of the species' activity patterns further complicates an assessment of its conservation status. The low number of specimens previously recorded may be a reflection of these features of the species life history. Clearly, *N. sloanei* is quite common after significant summer-autumn rainfall in the sandy heath shrubland habitats near Kellerberrin and Tammin, but more surveys are required following such rainfall events in other areas to accurately determine

its status and distribution. Data from further collection sites need to include detailed habitat measurements to help determine the species' full habitat requirements.

Despite our information on adult *N. sloanei*, there is nothing known about the immature stages. The surface soil and litter at Durokoppin in late summer is very hot and dry, so we assume that females either deposit their eggs in a moist sub-soil chamber, or provide them with properties which reduce desiccation until they hatch after the autumn rains.

The distribution and habitat of *N. distypsideroides* remain unknown. However, the information from *N. sloanei* may provide some clues as to when, if not where, to begin searching. If *N. distypsideroides* is present in Western Australia, then those northern areas of the State subject to summer cyclonic rainfall may be of interest, given the appearance of *N. sloanei* in hot weather associated with significant rainfall.

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